

Association Between EMS Agency Toolbox and Pain Management Practices by Race/Ethnicity

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Background

For injured patients, low rates of analgesia administration by emergency medical services (EMS) and demographic disparities are well-documented; however, few studies have explored modifiable agency-level factors to improve equitable pain management.

Study Objectives

Our objectives were to evaluate the association between EMS agency-level pain management options (toolbox size) and analgesic administration in patients with long bone fractures. Secondly we sought to identify any differences by race/ethnicity.

Methods

Study Design

Retrospective analysis utilizing prehospital electronic health records with linked emergency department diagnosis data from the 2021 ESO Data Collaborative.

Study Population

Patients presenting with acute pain who were diagnosed with long bone fractures.

Additional Inclusion Criteria:

- 911 Response
- GCS \geq 14 or AVPU \geq V
- Documented Initial Pain Score \geq 6
- At least 2 Pain Scores Recorded
- Transport Disposition
- Unit Level of Care = ALS
- No Analgesics Administered PTA

Exposure and Outcome Measures

Exposure was defined by the types of analgesic medication administered by the treating agency within the calendar year and the routes used. Each record was classified as being treated by an agency in one of four 'toolbox' categories:

- Opioids-only and Invasive-only
- Opioids-only/Invasive(+)
- Opioids(+) and Invasive-only
- Opioids(+) /Invasive(+)

Outcome was defined as administration of any analgesic by any route.

Analysis Methods

Wilcoxon Rank Sum Test
Multivariable logistic regression to account for agency clustering
Adjusted for fracture type, age, transport time, and race/ethnicity

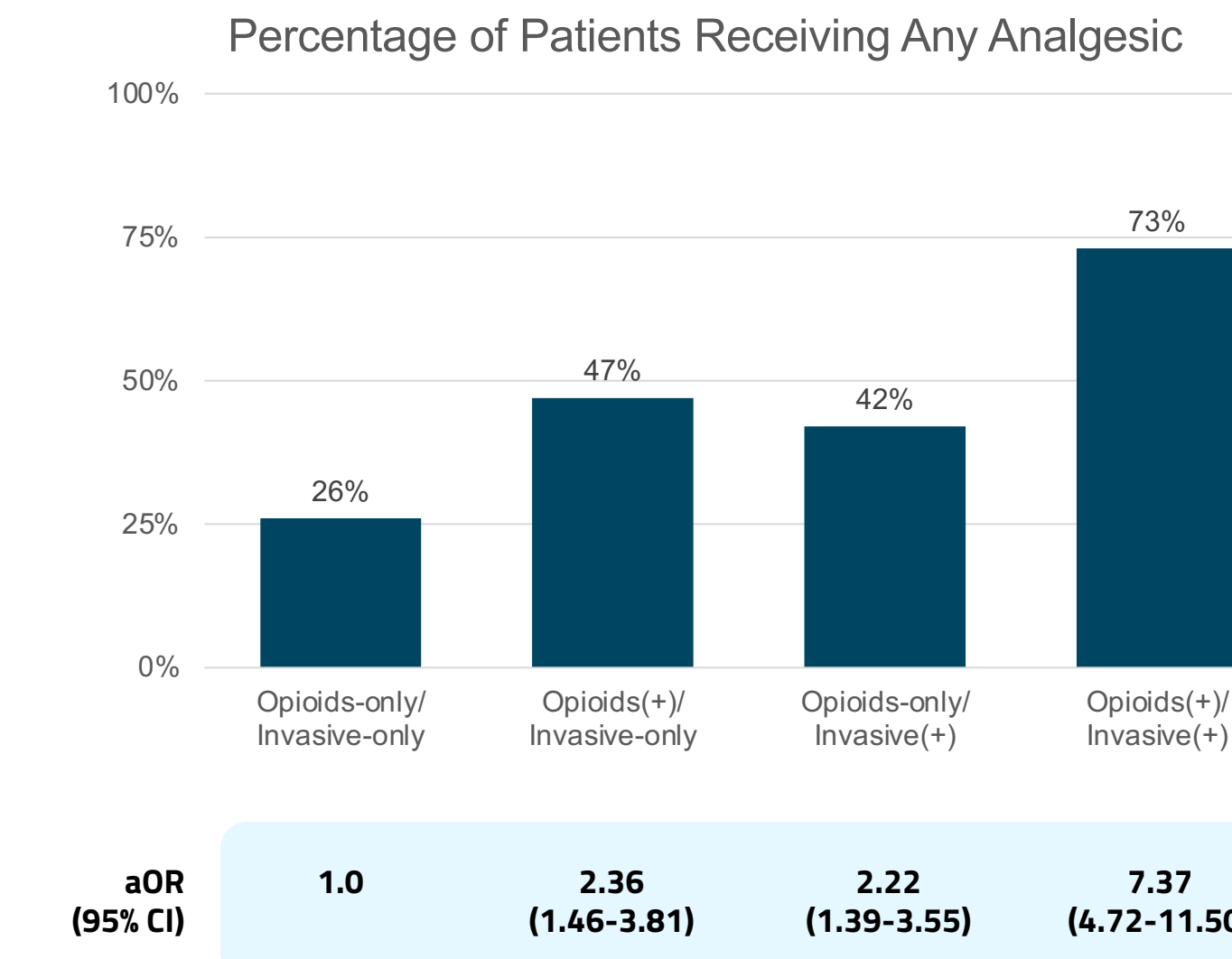
Results

Larger Toolkits Were Associated with Increased Administration of Analgesics

N = 14,560 patients transported by 423 EMS agencies

Service Type	Opioids-only/ Invasive-only N = 22 (5%)	Opioids(+)/ Invasive-only N = 49 (12%)	Opioids-only/ Invasive(+) N = 16 (4%)	Opioids(+)/ Invasive(+) N = 336 (79%)
Community, Non-Profit N = 171 (41%)	7 (4%)	24 (14%)	8 (5%)	132 (77%)
Fire-based N = 158 (37%)	10 (6%)	14 (9%)	6 (4%)	128 (81%)
Governmental, Non-Fire N = 64 (15%)	2 (3%)	7 (11%)	0	55 (86%)
Private, Non-Hospital N = 25 (6%)	3 (12%)	4 (16%)	1 (4%)	17 (68%)
Hospital N = 4 (1%)	0	0	0	4 (100%)

	Analgesia 69% (9,974) Row %	No Analgesia 31% (4,586) Row %	Overall N=14,560
Age, years			
Median (IQR)	67 (44-79)	67 (49-80)	14,558
Age Category			
0-5	61%	39%	62
6-12	75%	25%	260
13-17	81%	19%	355
18-65	68%	32%	6,303
65+	68%	32%	7,578
Gender			
Female	69%	31%	9,494
Male	68%	32%	5,054
Pain Reduction			
Yes	90%	10%	9,071
No	33%	67%	5,489



The odds of receiving analgesia increased 7-fold when being treated by agencies with larger pain management toolkits.

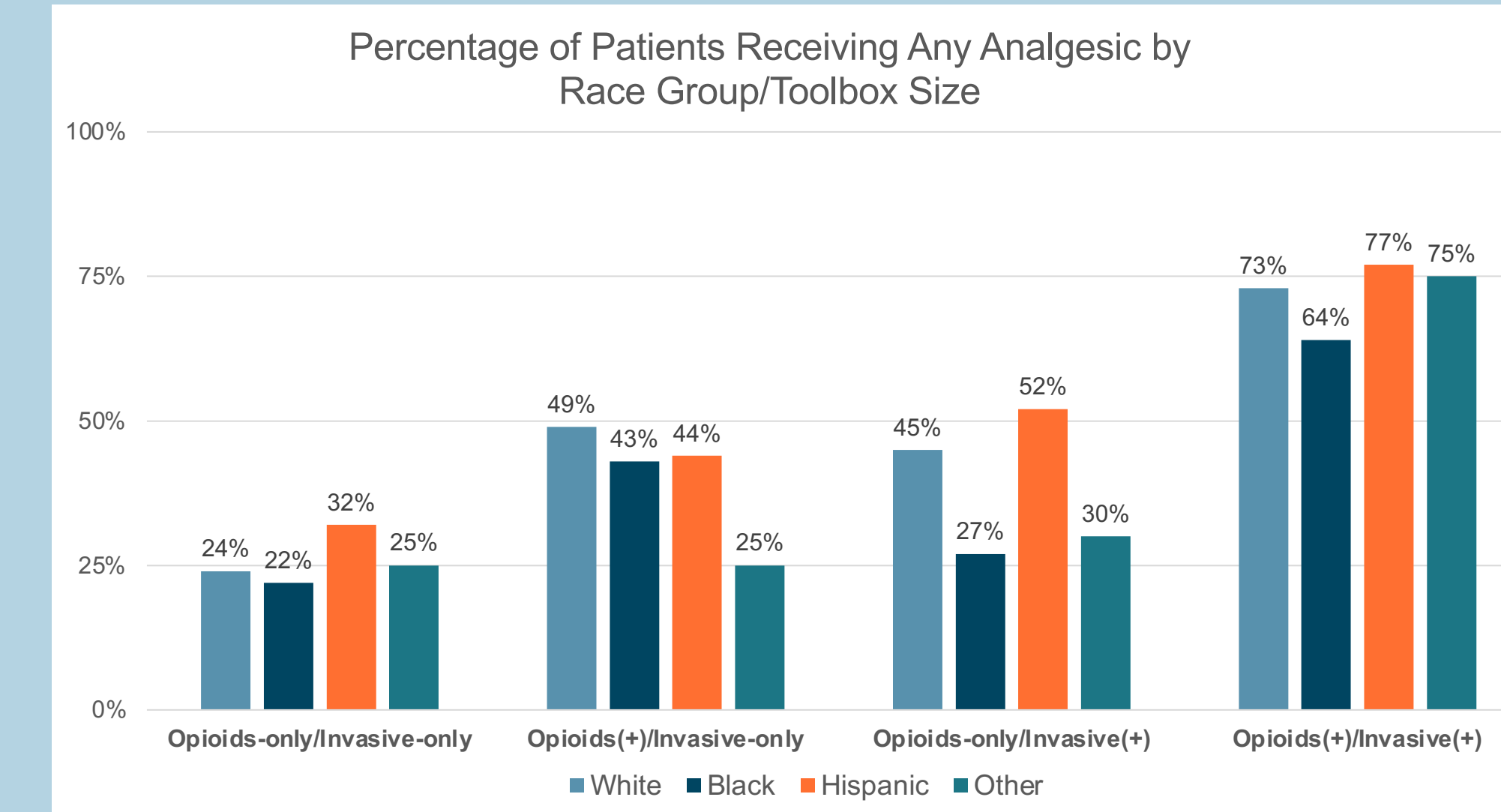
Racial Disparities in Rates of Analgesic Administration Persisted Overall

Analyses showed significantly decreased prehospital analgesic administration for Black patients compared with White patients. Disparities were less pronounced for the opioid invasive toolkit, however, less patients were treated for pain overall in this group.

Adjusted Odds of Receiving Analgesics by Race Group

Race Group	aOR (95%CI)
White	1.0
Black	0.65 (0.55-0.76)
Hispanic	1.30 (1.09-1.56)
Other	1.01 (0.68-1.49)

Overall, Black patients had 35% lower odds of receiving analgesics, and Hispanic patients had 30% greater odds of receiving analgesics, compared to White patients.



Racial Disparities in Rates of Analgesia Did Not Improve with Larger Toolbox Size

	Opioids-only/ Invasive-only N = 366 aOR (95%CI)	Opioids(+)/ Invasive-only N = 754 aOR (95%CI)	Opioids-only/ Invasive(+) N = 706 aOR (95%CI)	Opioids(+)/ Invasive(+) N = 12,734 aOR (95%CI)
White	1.00	1.00	1.00	1.00
Black	0.89 (0.52-1.54)	1.16 (0.64-2.10)	0.45 (0.38-0.52)	0.65 (0.54-0.78)
Hispanic	1.64 (0.75-3.59)	1.13 (0.67-1.88)	1.29 (0.88-1.90)	1.28 (1.04-1.58)
Other	0.63 (0.16-2.49)	0.57 (0.11-2.92)	0.57 (0.21-1.51)	1.08 (0.70-1.67)

Study Limitations

Limitations include possible misclassification of a medication carried for non-analgesic indications. We utilized a retrospective cohort design, with a convenience sample drawn from the data available in the ESO Data Collaborative. Further investigation is needed to continue to strengthen our understanding of the relationship between toolbox size and pain reduction, including further evaluation of the representativeness of the study population. Another limitation is the inability to definitively distinguish between administrations intended for sedation versus analgesia, such as in the case of ketamine.

Conclusions and Implications

In this multi-agency cohort, patients were substantially more likely to receive analgesia if the transporting EMS agency had analgesic options beyond opioids by invasive routes. While the agency-level results showed that an overwhelming majority of EMS agencies already utilize analgesic options beyond opioids by invasive routes, this study provides support for adding options in systems or agencies that use limited toolkits.

Despite the overall increase in analgesia administration, racial disparities were not reduced among agencies with larger toolkits. Improving equity in patient care warrants focused monitoring and proactive quality improvement initiatives.

Link to full abstract

